

REMARKS

By the present amendment, claims 1, 5 and 11 have been amended. Claim 8 has been canceled without any prejudice or disclaimer to the subject recited therein. claims 18 - 20 are newly presented for consideration. Accordingly, claims 1 - 7 and 9 - 20 are now pending in the application. Claims 1 and 11 are independent.

In the office action of May 23, 2007, the specification was objected to because of various informalities. The drawings were objected to because of various informalities. Claim 8 was objected to under 37 CFR 1.75(c) as being of improper dependent form. Claims 1 - 6, 8, and 11 - 16 were rejected under 35 USC §103(a) as being unpatentable over Japanese Patent JP 2000-060857 to Miwa et al ("Miwa") in view of Ophir et al ("Ophir"). Claims 7 and 17 were rejected under 35 USC §103(a) as being unpatentable over Miwa in view of Ophir, and further in view of US Patent 7,050,610 issued to Chen et al ("Chen"). Claims 9 and 10 were rejected under 35 USC §103(a) as being unpatentable over Miwa in view of Ophir, and further in view of Yamashita et al ("Yamashita"). These rejections are respectfully traversed.

The specification was objected to because of various informalities. Regarding this objection, the office action cites various instances of language containing grammatical and/or typographical errors.

By the present amendment, applicants have revised the specification and made amendments to address all of the issues raised in the office action. Withdrawal of this objection is respectfully requested.

The drawings were objected to because of various informalities. Regarding this objection, the office action cites various instances where typographical errors had been inadvertently incorporated into the figures.

Concurrently submitted herewith, are drawing replacement sheets containing figures 1, 3 - 12, and 15. The figures have been amended, in part, to address all of the issues raised in the office action. Withdrawal of this rejection is therefore respectfully requested.

Claim 8 was objected to under 37 CFR 1.75(c) as being of improper dependent form for failing to further limit the subject matter of a previous claim.

The cancellation of claim 8 has rendered this particular ground of rejection moot.

Claims 1 - 6, 8, and 11 - 16 were rejected under 35 USC §103(a) as being unpatentable over Miwa in view of Ophir. Regarding this rejection, the office action indicates that Miwa discloses a system that includes an ultrasound probe, a first image production means, an image display, at least one piece of reference information, a second image, and a variation operation. The office action admits that Miwa fails to explicitly disclose a distortion operation or displaying of distortion information. Ophir is relied upon for disclosing a distortion operation based on the comparison of a locus of points in a region of interest (ROI) in the two images, and displaying of the distortion information. Applicants respectfully disagree.

As amended, independent claim 1 defines a diagnostic ultrasound system that comprises:

- a probe for measuring a subject using ultrasound by bringing said probe into contact with a subject in a first state;

- a first image production means for producing a first image of said subject according to information sent from said probe;

- an image display means for displaying said first image produced by said first image production means;

- a second image production means for producing a second image of said subject according to information measured by bringing the probe into contact with said subject in a second state different from said first state;

a distortion operation means for calculating distortion information on a desired region-of-interest in said second image;

a display control means for controlling the display of the distortion information, which is calculated by said distortion operation means, on said image display means;

a means for setting at least two feature points as reference information on said first image displayed by said image display means;

a variation operation means for calculating a change of a distance between said two feature points of said first image versus said second image; and

a means for displaying a relationship between the change of the distance and the distortion information.

According to independent claim 1, the diagnostic ultrasound system includes a probe for measuring a subject using ultrasound by bringing the probe into contact with the subject while in a first state. A first image production means is used for producing a first image of the subject according to information sent from the probe, while an image display means displays the first image produced. A second image production means is used for producing a second image of the subject according to information measured by bringing the probe into contact with the subject in a second state that differs from the first state. A distortion operation means calculates distortion information on a desired region of interest (ROI) in the second image, and a display control means controls display of the distortion information on the image display means. The diagnostic ultrasound system also includes means for setting at least two feature points as reference information on the first image being displayed. A variation operation means calculates a change of a distance between the two feature points of the first image relative to the second image. The system further includes means for displaying a relationship between the change of distance and the distortion information.

According to independent claim 1, distortion of biological tissue in a region of interest (i.e., ROI#1, ROI#2) is displayed in correspondence with a change in

distance between the two feature points. The tissue of the ROI is diagnosed as being normal or abnormal based on the distortion information of the ROI and the change in distance between the two feature points. This is in contrast to conventional diagnostic systems wherein the magnitude of distortion in the ROI is displayed on the monitor to determine whether the biological tissue is normal or abnormal. However, the magnitude of the distortion is directly dependent upon the magnitude of the stress being applied to the tissue in the ROI. Consequently, the tissue cannot be properly diagnosed without knowing the magnitude of the stress applied to the tissue when the distortion is obtained. Furthermore, if the tissue in the ROI is diagnosed as being normal when the stress applied to the tissue is at a set value and the magnitude of the distortion in the ROI is less than the threshold value, it is possible that the tissue in the same ROI can be anaplastic, thus contributing to ambiguous results.

The office action alleges that the combination of Miwa and Ophir discloses all of the features recited in independent claim 1. This does not appear to be the case. As admitted in the office action, Miwa fails to disclose a distortion operation of displaying of distortion information. Ophir is relied upon for disclosing a distortion operation and display of distortion information. Reference is directed to page S27 , column 1. However, Ophir only discusses the equation for estimating the local axial strain. Ophir does not calculate a change in distance between the two feature points from the first and second images. Further, Ophir does not disclose displaying of a relationship between the change in distance and the distortion information. The office action additionally alleges that Miwa discloses a variation operation. This operation, however, differs from the claimed variation operation means which calculates a change of distance between the two feature points of the first image and

the second image. Even if this disclosure could be construed as disclosing this feature, Miwa is completely silent on displaying a relationship between the change of the distance and the distortion information. In fact, all of the cited references are silent on this particular feature.

It is therefore respectfully submitted that independent claim 1 is allowable over the art of record.

Claims 2 - 7, 9, 10, and 18 - 20 depend from independent claim 1 and are therefore believed allowable for at least the reasons set forth above with respect to independent claim 2. In addition, these claims each introduce novel elements that independently render them patentable over the art of record.

As amended, independent claim 11 defines a method for displaying information on distortion of biological tissue in an ultrasound ultrasonic image. The method comprises:

- a first image production step for measuring a subject using ultrasound by bring a probe into contact with a subject in a first state, and producing a first image of said subject according to the measurement information;

- an image display step for displaying said first image produced at said first image production step;

- a step for setting at least two feature points as reference information on said first image displayed at said image display step;

- a second image production step for measuring a subject using ultrasound by bring said probe into contact with said subject in a second state different from said first sate, and producing a second image of said subject according to the measurement information;

- a variation operation step for calculating a change of distance between said two feature points, which is set on said first image at said setting step, into a counterpart visualized in said second image;

- a step for seeking a relationship between the variation calculated at said variation operation step and distortion information on a desired region-of-interest which is setting on said second image; and

- a display control step for controlling the display of said relationship, which is calculated at said distortion operation step sought at said step for seeking, at said image display step.

According to various features of independent claim 11, a change in distance is calculated between two feature points on the first image and two corresponding feature points on the second image. A relationship is determined between the variation that is calculated and distortion information on the desired ROI of the second image. The relationship is subsequently displayed on the display device.


As previously discussed with respect to independent claim 1, the art of record fails to provide any disclosure or suggestion for determining a relationship between the change of distance between the feature points and different images and the distortion information. It is therefore, respectfully submitted that independent claim 11 is allowable over the art of record.

Claims 12 - 17 depend from independent claim 11, and are therefore believed allowable for at least the reasons set forth above with respect to independent claim 11. In addition, these claims each introduce novel elements that independent render them patentable over the art of record.

In view of the above amendments and remarks, applicants submit that all claims present in this application should now be in condition for allowance and issuance of an action of favorable nature is courteously solicited.

To the extent necessary, applicants petition for an extension of time under 37 CFR 1.136. Please charge any shortage in the fees due in connection with the filing of this paper, including extension of time fees, to the deposit account of Antonelli, Terry, Stout & Kraus, LLP, Deposit Account No. 01-2135 (Case: 389.44528X00), and please credit any excess fees to such deposit account.

Respectfully submitted,
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Appendix

Amendments to the Drawings:

The attached sheet of drawings includes changes to Figs. 1, 3, 4, 6, 8, 9, 10, 11A, 11B and 15. These sheets, which include Figs. 1, 3-4, 5-6, 7-8, 9-10, 11A-12B, and 15, replace the original sheets including Figs. 1, 3-4, 5-6, 7-8, 9-10, 11A-12B, and 15 which correct errors in the figures as noted by the Examiner.

Attachment: Replacement Sheets